D0 Upgrade Electronics

CTT Channel Mapping from Warm End to MCM

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This short note covers the mapping of channels from the warm end of the VLPC cassettes to the MCM's (multichip modules), on the Analog Front End (AFE), board. It covers this mapping for the CFT Axial and Stereo channels, the CPS Axial and Stereo channels, and the FPS channels. The information in this note supersedes the information in any earlier published note.

This note is meant to outline the mapping in more general terms and does not attempt to map the individual channels.

AFE Boards

There are two versions of the AFE board. One version has 8 multichip modules, 8-MCM, mounted on it, and is used for the CFT Axial and most of the CFT Stereo channels. A pair of 8-MCM AFE boards is shown in figure 1. The figure shows a cartoon of a cassette and the two AFE boards that are mounted on it in an unfolded view. The cassette modules are viewed from below of the warm end. Each of the AFE boars is viewed from the component side. If one were to fold the drawing by 90 degrees along the bottom of each of the two boards, printing out, the now U shaped drawing would show the boards as mounted on the cassette.

There are 8 VLPC modules in each VLPC cassette, each of which has 128 channels. One half of these channels from each module are routed to the right hand board and one half to the left hand board. These two handedness boards are the same board with exceptions. These exceptions are that some of the key components are placed differently to define the handedness of each board. With the component side up and the bottom of the board to the viewer, the right hand board has the functional backplane connectors on its right hand side. The left hand board has the backplane connections on its left hand side.

The other AFE board is the 12-MCM version. On this board one half of the input signals, 256, are charge divided into both a low gain channel and a high gain channel. Each of these dual gain channels go into a pair of MCM's, one for the low gain channels

and another for the high gain. The remaining 256 channels are single gain. This same board is used for both the CPS and the FPS. In the CPS use, the dual gain channels are used for the CPS inputs and the single gain channels are used for some of the CFT Stereo inputs. This board is shown in figure 2. The channel routings are shown with blue arrows with blue text. Each module of 64 channels is routed either to a single gain, single MCM location or to a dual gain, dual MCM location.

The FPS utilization is more complicated. Here the back or shower layers of the detector are put into the dual gain channels. Each detector wedge has 144 strips in the shower layer. Since each cassette module only holds 64, these channels are routed into two, for 128, modules and the 16 remaining share an adjacent module with the single gain channels. The single gain channels are the forward or MIP layers of the detector wedge and comprise a total of 102 strips. Each MCM has 72 channels so from the modules the signals are routed as shown with the red arrows and red text to completely load each of the dual gain MCM pairs. The number of forward strips doesn't fill out the remainder of module channels or MCM channels. The numbers routed to each are shown in the figure.

VLPC Cassette

Because of the FPS detector geometry and the requirement that the VLPC gain of the MIP strips be maximized the FPS cassettes are custom built. The relative layout of the VLPC high and low gain VLPC channels are shown for the FPS in figure 4. The small red boxes represent a low gain VLPC with 8 channels, the green represent the high gain. The green stippled VLPC are not used. Figure 5 shows the VLPC layout for the CFT/CPS cassettes. Here the higher gain is used for the CFT and the lower gain for the CPS. Now however the gain is uniform within each module.

Neighbor Layout

The FLEX cable which routes the analog signals from the VLPC to the AFE board is designed to transfer the lowest possible amount of heat back down to the VLPC and liquid helium. An undesired side effect of this constraint is that there is significant cross talk between adjacent channels on the FLEX cable. Once on the AFE board the relative order between traces is preserved over most of the distance on the board. The order is changed upon entering the multichip modules. This does not add any new cross talk components across other channels pairs, but it does add one more mapping step for the SVX channels relative to the VLPC channels.

Because there is a scrambling in signal order at the VLPC substrate, which cannot be unscrambled on the AFE board; one can choose to have adjacent detector strips as neighbors for cross talk. Alternatively, one can choose that adjacent detector channels be adjacent in the SVX readout. Both cannot be achieved at the same time.

Map from Modules to MCM to LVDS

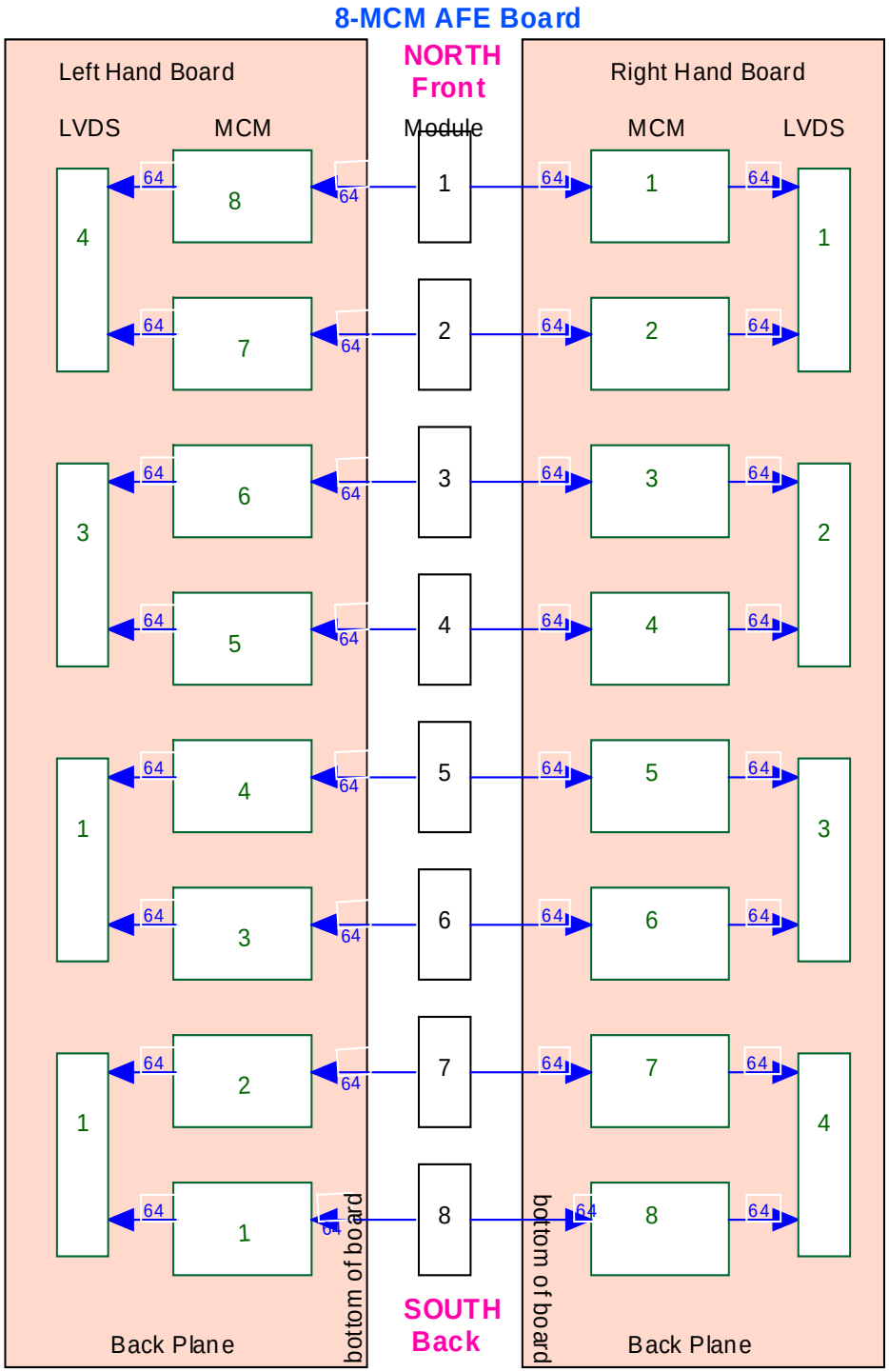

Figure 1 - Signal routing from VLPC cassette modules to AFE board MCM's to LVDS output. Cassette modules are numbered from north to south. AFE board MCM's are numbered from left to right on board with component side up.

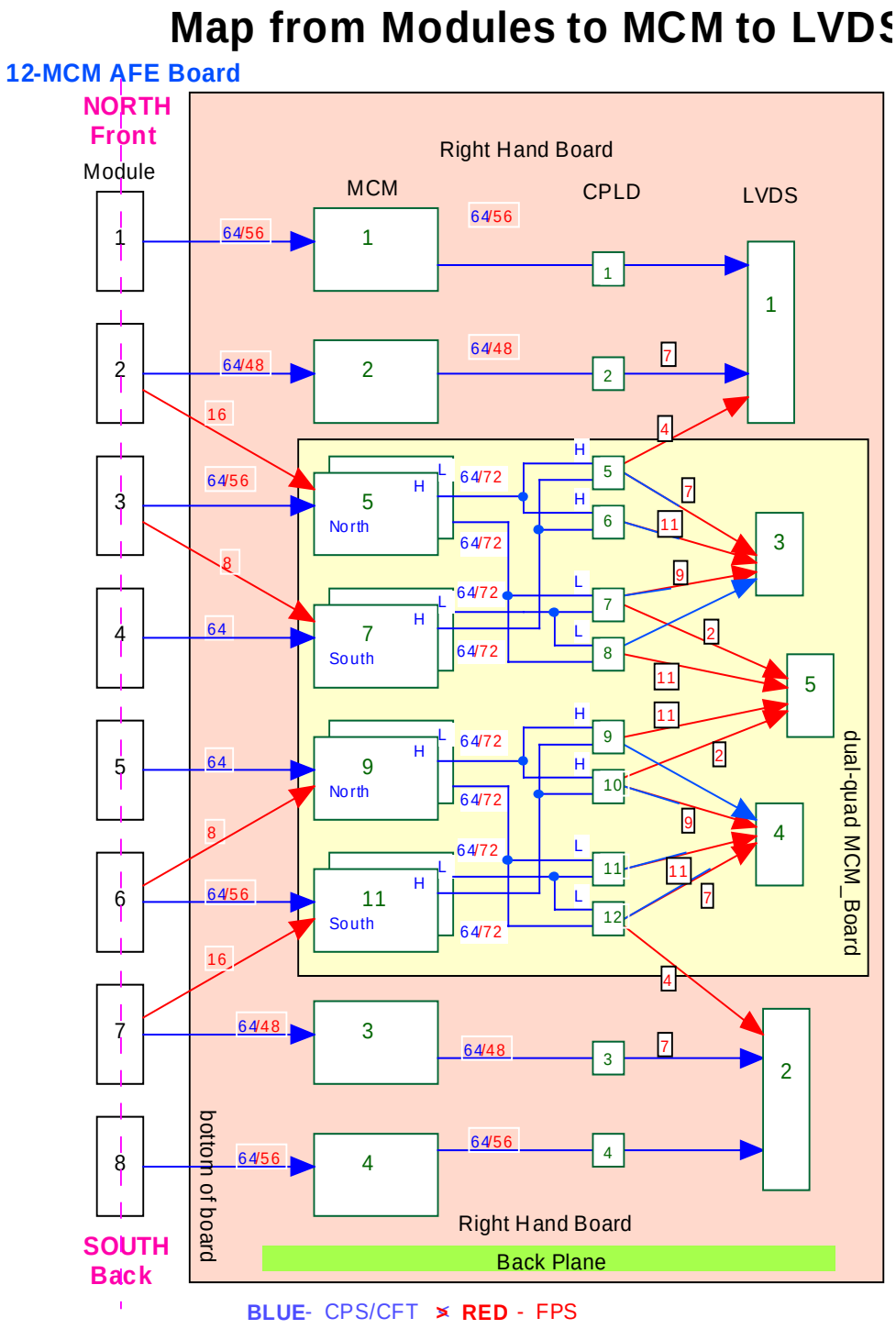

Figure 2 - Analog signal routing from VLPC cassette modules to AFE board MCM modules on the right hand version of the 12-MCM board. The blue numbers are the trace counts for the CFT/CPS combined cassettes, the red for the FPS.

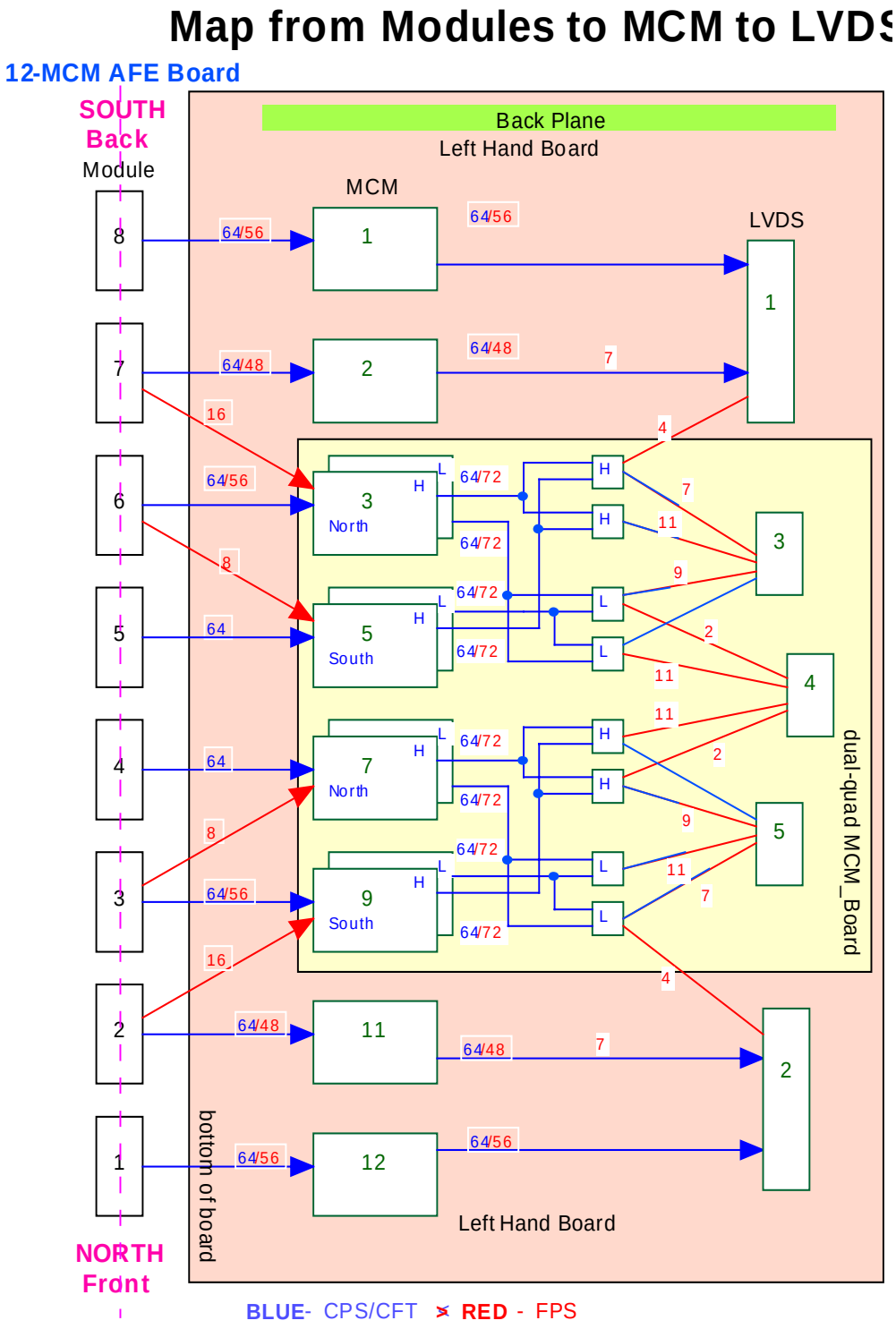

Figure 3 - Analog signal routing from VLPC cassette modules to AFE board MCM modules on the left hand version of the12-MCM board. The blue numbers are the trace counts for the CFT/CPS combined cassettes, the red for the FPS.

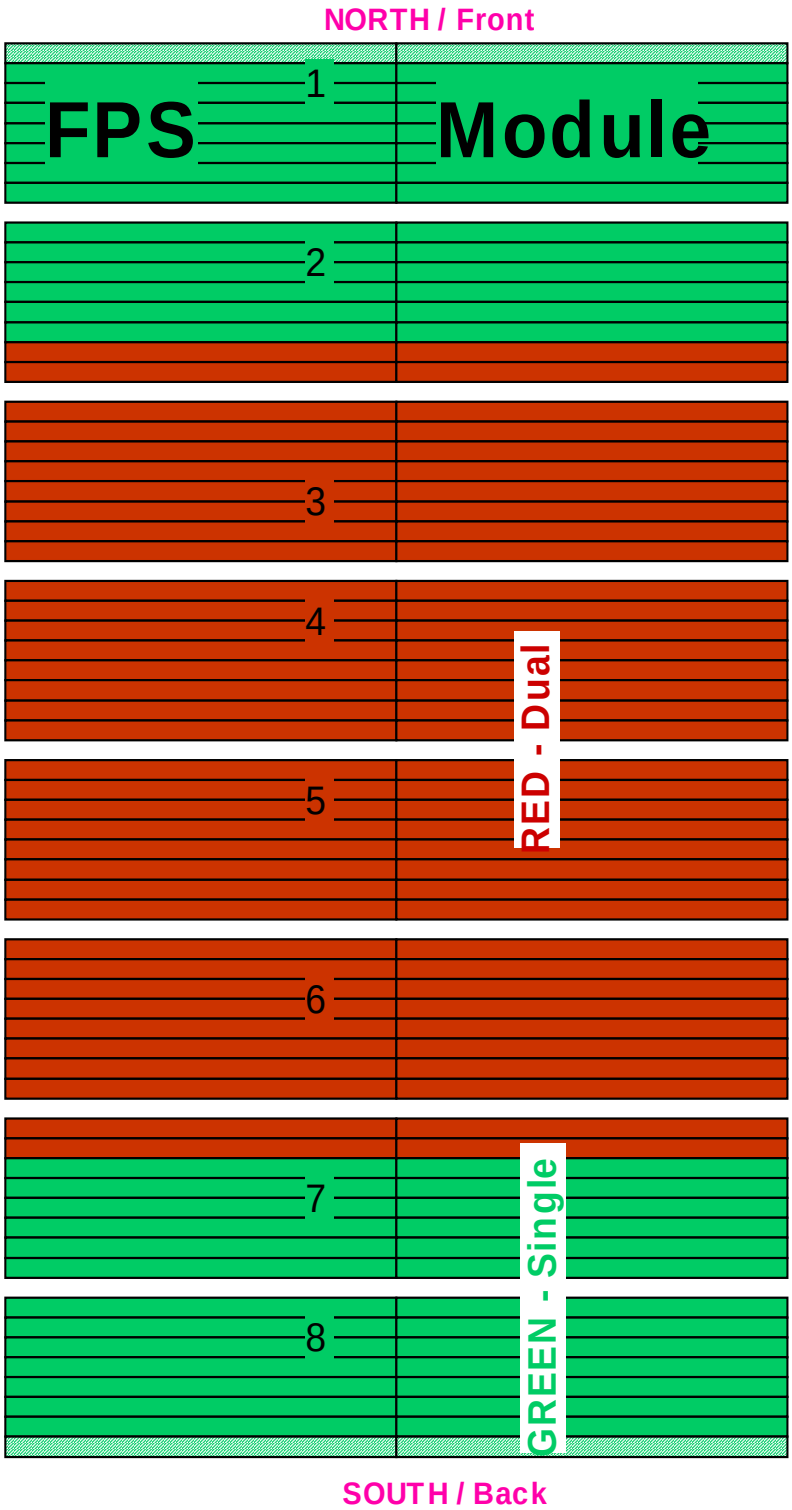

Figure 4 - VLPC chip-type location in the VLPC cassette viewed from above grouped into the 8 modules. Each rectangle represents a single VLPC chip. The dual channels are the shower layers of the FPS. The single are the forward layers. The shaded VLPC chips at each end can be left out.

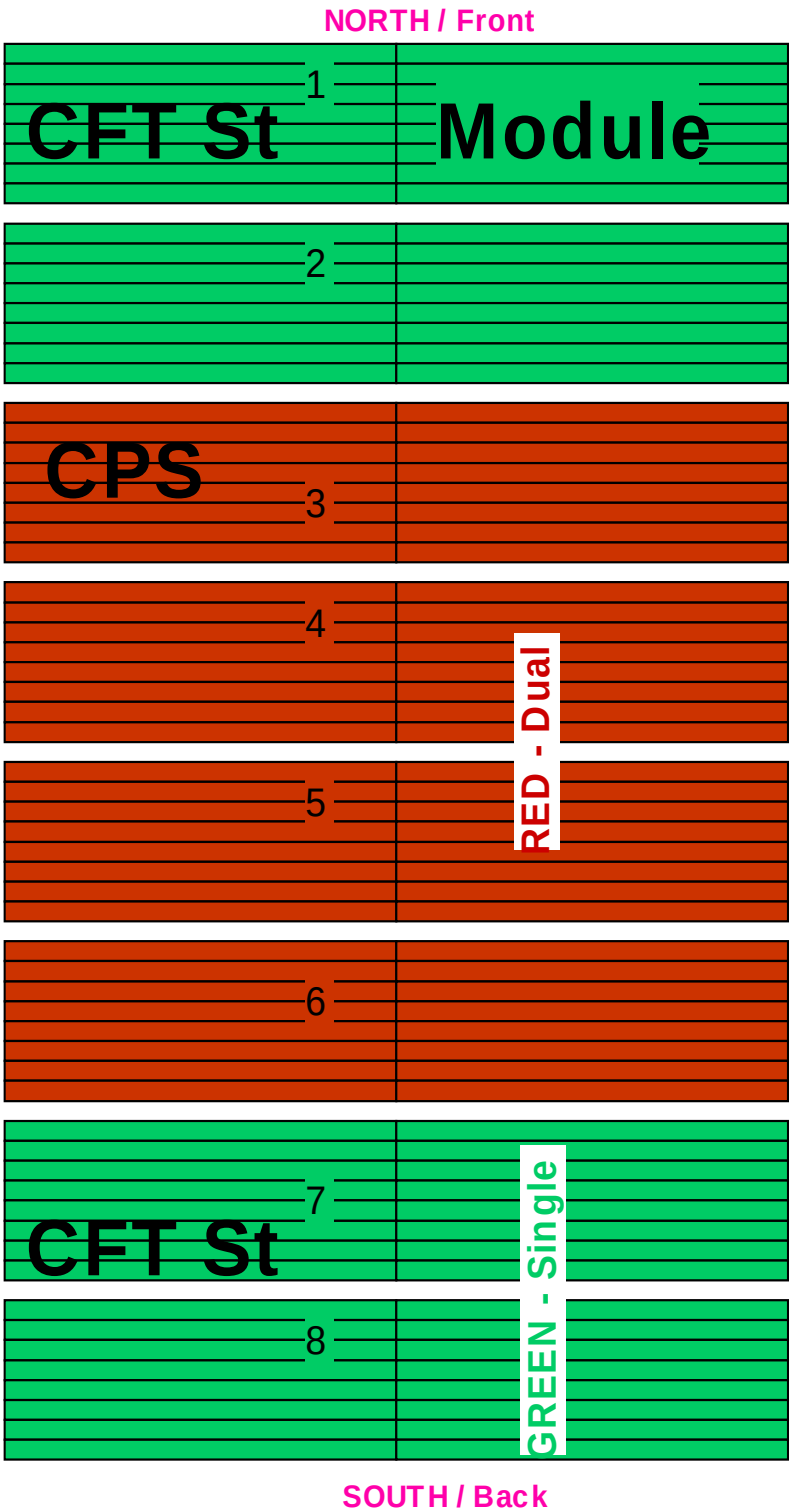

Figure 5 - Channel location on the warm end connectors of the VLPC cassette. The dual channels are for the CPS strips. The single channels are for the CFT stereo fibers.